A machine for removing sump pit water and process for making same

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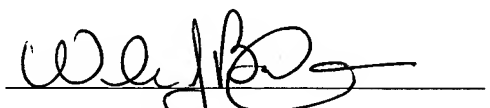

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Title of the Invention

A machine for removing sump pit water and process for making same

Statement Regarding Federally Sponsored Research or Development

Not Applicable

Description of Attached Appendix

Not Applicable

Background of the Invention

This invention relates generally to the field of basement flooding and more specifically to a machine for removing sump pit water and process for making same. The use of a sump pump in the basement of a residential or commercial building is standard equipment to avoid flooding. Electrical driven motor pumps are used standard as primary pumps and operate with the rising and lowering of sump ground water levels. In the case of power failures the electric operated pump does not operate hence the basement area floods.

Battery back-up pumps are commonly used in these applications but lack sufficient capacity to pump for long durations. Water powered pumps provide unlimited pumping time providing city water pressure is available. However, water powered pumps as shown in US patent no. 5,302,088 & patent no. 5,613835 require the ejector pump to be submersed under the sump water. This allows the development of corrosion and mineral deposits to form on the working parts, which cause mechanical

failures. In addition, the placement of the ejector pump into the sump pit creates space interference problems in relationship to the primary pump.

An ejector pump constructed in accordance with the invention does not have working parts in contact with sump water eliminating the cause of such failures. The most commonly used technology in water-powered sump pumps is the venturi principal utilizing the flow of pressured potable water through a nozzle, commonly known as an ejector. This action creates a suction effect and pulls sump water into a housing, mixing with the potable water and hence discharging the mixture. The raising of sump pit water to a high level activates a float mechanism, which begins the pumping action.

The most commonly used technology is the battery driven centrifugal pump that is mounted into the bottom of the sump pit. These pumps operate via a marine battery, a charger, and a float switch. When the sump water rises to a high level the pump is energized which begins the pumping process.

The prior technology of the water-powered pump is deficient in that the ejectors are located inside the sump pit and submersed under water. The ejectors may corrode and/or form mineral deposits on them, hence affecting the operation of the pump. The ejectors located inside the sump pit are difficult to install due to the fact that space is limited in relationship to the main pump also inside. When the ejectors are mounted inside the pit, it requires that the sump water be pumped upward creating a backpressure, which greatly reduces the pumping volume.

The prior technology of the battery powered pump is deficient in the same manner as the water powered pump being located inside the pit, but also having limited pumping capacity depending on battery condition. The owner is required to monitor and

change out heavy, dangerous, and expensive batteries.

Brief Summary of the Invention

The primary object of the invention is to provide a sump ejector that is mounted outside the sump pit.

Another object of the invention is to provide a sump ejector that pumps greater volumes than that of existing pumps.

Another object of the invention is to provide a sump ejector that has an adjustable length of run time.

A further object of the invention is to provide a float valve that has a positive on and off position.

Yet another object of the invention is to provide a sump ejector system that is not in contact with sump water.

Still yet another object of the invention is to provide a sump ejector system that will not allow sump water to back siphon into the potable water supply.

Another object of the invention is to provide a sump ejector system that can be pressurized without damage.

Other objects and advantages of the present invention will become apparent from the following descriptions, taken in connection with the accompanying drawings, wherein, by way of illustration and example, an embodiment of the present invention is disclosed.

In accordance with a preferred embodiment of the invention, there is disclosed a machine for removing sump pit water comprising: sump ejector mounted at the same elevation as the discharge pipe, eliminating back pressure which reduces pumping rates, sump ejector system with an adjustable control allowing the pump to run for various lengths of time, an independent discharge line, sump ejector with an independent suction line, sump ejector with an internal check valve, sump ejector with an atmospheric vent preventing backflow, and sump ejector with integral backflow prevention device.

In accordance with a preferred embodiment of the invention, there is disclosed a process for removing sump pit water comprising the steps of: sump ejector mounted at the same elevation as the discharge pipe, eliminating back pressure which reduces pumping rates, sump ejector system with an adjustable control allowing the pump to run for various lengths of time, an independent discharge line, sump ejector with an independent suction line, sump ejector with an internal check valve, sump ejector with an atmospheric vent preventing backflow, and sump ejector with integral backflow prevention device.

Brief Description of the Drawings

The drawings constitute a part of this specification and include exemplary embodiments to the invention, which may be embodied in various forms. It is to be understood that in some instances various aspects of the invention may be shown exaggerated or enlarged to facilitate an understanding of the invention.

Figure 1 is an elevation assembly diagram of the invention.

Figure 2 is a sectional view of the ejector and valve.

Figure 3 is a sectional view of the float valve.

Detailed Description of the Preferred Embodiments

Detailed descriptions of the preferred embodiment are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure or manner.

Detailed Description of the Invention

Referring to the drawing and more particularly to figure 1, reference letter- "A" indicates a sump pit having water inlet pipes as shown by letter- "B". An ejector valve mounted to the basement ceiling rafters letter- "C" as best shown in figure # 1 an ejector valve letter-"D". The ejector valve as detailed in figure #2 comprising of valve body 6 a valve cover 2 and a solid flexible rubber diaphragm 5. The ejector valve having a lower chamber 25, an upper chamber 26 and being isolated by said diaphragm 5. Potable water from a pressure source normally from a city water system enters the inlet 27 of the ejector valve, hence pressurizing the lower chamber 25. An adjustable timing control 3 being a needle type valve of standard industry construction, its inlet is mounted to the ejector valve body 6 and is also pressurized by water from inlet 27. The timing control 3, having an outlet 36 in communication with said upper chamber 26 via a hollow transfer tube 4. The ejector valve cover 2 mounted and held in position to said ejector valve body 1, using screws 37, hence compressing said solid flexible rubber

diaphragm 5 for the purpose of providing a leak tight seal. The hollow transfer tube 4 is connected to a transfer tee 8, which is mounted to ejector valve cover 2 and having three connection ports in communication with the pressure source hence pressurizing said upper chamber 26. The ejector valve housing 6 having a water passageway 29 and a valve seat 38. Moreover the pressurized water in the upper chamber 26 compressing against the larger area of flexible diaphragm 5 causing a downward force sealing tight on the valve seat 38. Similarly the pressurized water in lower chamber 25, causing an upper force against a lesser area of the solid flexible rubber diaphragm 5, in this way not effecting any movement of said flexible rubber diaphragm 5. The upper chamber 26 houses a spring 7, bias downward which maintains the closure of the solid flexible diaphragm 5 when the opposing forces caused by the pressurized water in both upper chamber 26 and lower chamber 25, are equal.

The transfer tee 8 having a port in communication with the hollow transfer tubing 4 and also pressurized with water is connected to a float valve by illustration in figure # 1, letter-"E". The float valve as detailed in figure #3 having an internal chamber 18, which is pressurized by the water source via said hollow transfer tubing 4. The float body 14 is sealed from the pressurized water source by a valve stem 15, stem o-ring 20 and maintained closed by a spring 21.

Said float valve body 14 having an external float arm 13 and a hollow ball float 22, which when pivoted causes said valve stem 15 to move into the internal chamber 18. The movement of the valve stem15, allows the pressurized water to escape through a valve stem port opening 39, to an exterior compartment 30 which is vented to the atmosphere and hence exiting through a vent port 31. The releasing of pressurized water through the said vent port 31 causes the loss of pressure in the float valve internal

chamber 18, which is in communication with said hollow transfer tube 4; and is in communication with the upper chamber 26 of the ejector valve, hence, causing the said flexible diaphragm 5 to lose it's downward force and move off the valve seat 38 by the upward force of the pressurized water in the lower chamber 25.

As a consequence the movement of said flexible diaphragm 5 off of the valve seat 38 allows the pressurized water to flow from the inlet 27 into the valve passageway 29 thus traveling into an ejector housing 1. The ejector housing 1, contains an inlet venturi nozzle 9 and an outlet venturi nozzle 10. The pressurized water source creating a high velocity stream through the inlet passageway 23 and enters into the throat of the venturi 24. An area of decreased pressure is thereby produced at the throat of the venturi 24. In this way the decreased pressure or suction, pulls sump water from an independent suction pipe figure 1, letter "F"; which is in communication with the sump pit. The ejector housing 1, contains a chamber 34 where the pressurized water source and sump water combine and said mixture exits through the venturi 24, into the independent discharge line figure 1, letter "G" to the outdoors. Thus it is seen that the independent discharge line provides an atmospheric vent allowing air to gain entrance into the system preventing a back siphon of sump water should the pressurized water source reverse flow. A suction line check valve 33, of standard industry design is connected to the ejector body 1, vacuum chamber 35 preventing reverse flow downward of the pressurized water through the independent suction line into the sump pit. The check valve 33 prevents the pressurized water source from filling the sump pit and flooding the basement area.

When the level of sump water in the pit is lowered to a position where the ball float 22 is no longer buoyed by the sump water, the weight of the ball float 22 allows it to

drop to a low or closed position hence closing said float valve stem 15 and sealing against stem o-ring 20. Upon closing, said valve chamber 18, transfer tube 4, and upper valve chamber 26 begin to pressurize with water. The rate of pressurized water is controlled by an adjustable timing control 3 being a needle valve of standard industry design, being in communication with said valve body 6 and the hollow transfer tube 4. The adjustable timing control 3 restricts or slows down the repressurizing of the upper valve chamber 26, transfer tube 4, and valve chamber 18. Hence the flow of pressurized water continues through the valve passageway 29 until the force applied upon said solid flexible rubber diaphragm 5 hydraulically overcomes the force in the lower chamber 25. The solid flexible rubber diaphragm 5 is assisted by a spring 7, hence closing against the valve seat 38 stopping the flow of pressurized water.

As hereinbefore set forth in the event that the pressurize water at the water inlet 27 should back flow or reverse direction, it is possible to develop a siphon effect which can pull sump water backwards into pressurized water source through the valve passageway 29. A non-return valve 12 being a check valve of standard industry design is incorporated into the hollow transfer tube 4, after the timing control 3 and before the transfer tee 8. The prevention of this reverse flow of sump water is by said non-return valve 12 sealing off or maintaining the pressurized water in the upper chamber 26. The maintaining of pressurized water forces the flexible rubber diaphragm 5 downward which prevents it from moving off of said valve seat 38, thus maintaining closure of ejector valve.